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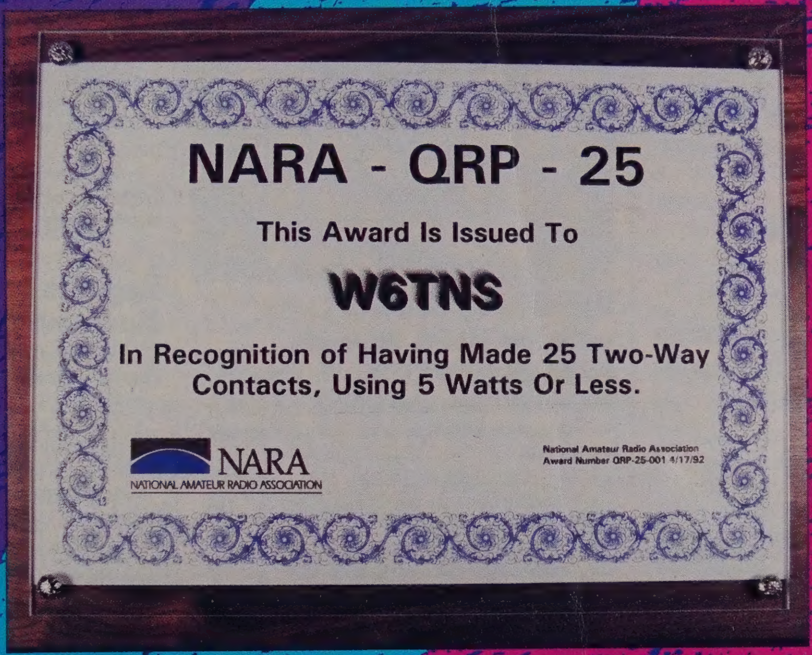
The Amateur Radio
COMMUNICATOR

JULY/AUGUST 1992

FOR THE NOVICE AND TECHNICIAN AMATEUR

Volume 2 Number 4

- *The NARA QRP-25 Award*
- *Vertical Antennas*
- *From The Mailbag*
- *Live Classroom Demonstrations*
- *The Adventures of Dan and Burke*



NARA - QRP - 25

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W6TNS

In Recognition of Having Made 25 Two-Way Contacts, Using 5 Watts Or Less.

NARA
NATIONAL AMATEUR RADIO ASSOCIATION

National Amateur Radio Association
Award Number QRP-25-001 4/17/92

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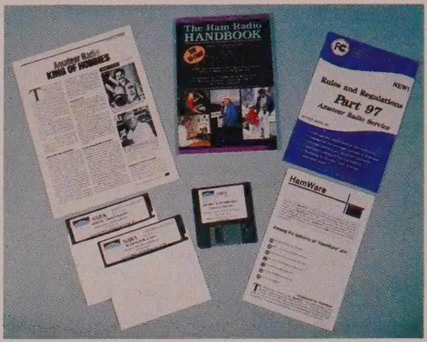

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The **NARA Codeless Technician Package (IBM)** is just **$29.95 (3.00 S&H)** #P110.

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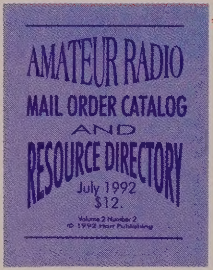

NEW!

Amateur Radio Mail Order Catalog And Resource Directory

This highly valuable reference directory contains over 1,500 entries, in 185 categories of Amateur radio resources! You'll find names, address' and phone numbers on everything from Alternative energy to Zener diodes. Including parts and equipment, kits and keyers, even personalized hats, mugs and license plates. There is even an extensive listing of radio clubs worldwide, international radio magazines, and over 100 free catalogs available.

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The **HamWare,** IBM compatible (5 1/4" and 3 1/2" disks) testing software, provides all the practice you need to get your first license or to upgrade. Drawings and diagrams appear automatically on screen along with the appropriate questions, and there's even a practice mode, complete with hints, answers and help screens. There's even a handy on-screen scientific calculator. Your choices are mouse or keyboard selectable. As a bonus, each disk includes a copy of **Morse** software for learning Morse code.

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HamWare is available at Amateur Radio dealers or directly from NARA. License classes are sold individually. Each class is only **$14.95 ($2.00 S&H).**

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- An extensive list of Contact Volunteer Examiners.

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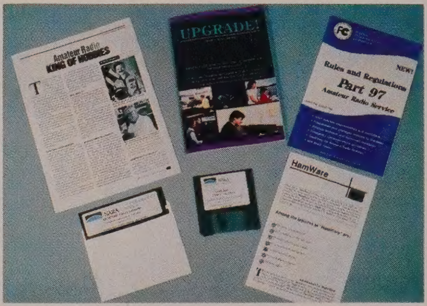

Upgrade To General Class with the NARA Upgrade Package

NARA has put together all the essential tools you'll need to upgrade to General class. This value-packed offer includes:

- *UPGRADE!* book by Donald L. Stoner, W6TNS
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- An extensive list of Contact Volunteer Examiners

The **NARA Upgrade Package** is available at Amateur Radio equipment dealers or directly from NARA for only **$29.95 ($3.00 S&H)** #P240.

A FREE issue of *The Amateur Radio Communicator* will be sent to you when you order any product from NARA! Your magazine will be mailed at a later date.

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MacHam is one of the most elegant and useful series of Amateur radio programs ever written for the "Mac." All required circuit diagrams are displayed with the question right on the screen. If the test is printed, the diagrams are included.

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Choose from the following:

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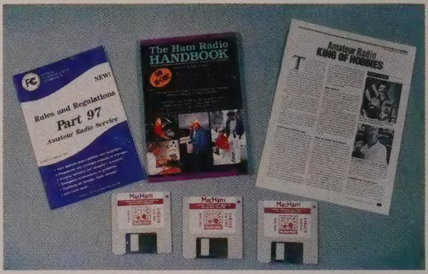
System requirements: *Any Macintosh computer, Mac Plus or newer, 2MB RAM with hard drive and Mac compatible printer. Fully compatible with System 7.0 and 6.0.7; ships with HyperCard 2.1 on two 3 1/2" 800K disks.*



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- *Ham Radio Handbook,* by Donald Stoner, W6TNS
- Ham radio *FCC Rules and Regulations, Part 97*
- *Amateur Radio—King of Hobbies*
- An extensive list of Contact Volunteer Examiners

Order direct from NARA today. **The MacHam Education Package** is only **$49.95 ($3.00 S&H)** #P320.

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- MacHam General Class software
- *UPGRADE!* book by Donald L. Stoner, W6TNS
- Ham radio *FCC Rules and Regulations, Part 97*
- *Amateur Radio—King of Hobbies*
- An extensive list of Contact Volunteer Examiners

The **MacHam Upgrade Package** is only **$44.95 ($3.00 S&H)** #P340.

Practice The Code With These Outstanding Code Tapes!

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- Novice/Technician Class 0 to 5wpm #T710.
- General Class 5 to 14wpm #T720
- Extra Class 12 to 24wpm #T730.

Order your set today for only **$11.95 ($2.00 S&H).**

For The Fastest Service, Call NARA At 1-800-GOT-2-HAM (1-800-468-2426)

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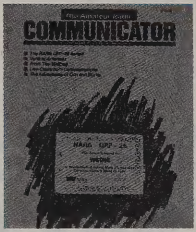

One of the most popular NARA awards is the QRP-25 shown on the cover of this issue. This beautiful plaque will grace the wall of our editor, Don Stoner, W6TNS. You can earn a similar plaque (or the wallpaper equivalent) by contacting any 25 stations using five watts or less. See the Awards Column for more information.

The Amateur Radio Communicator

The Amateur Radio Communicator is published bi-monthly and is the official journal of the National Amateur Radio Association (NARA), P.O. Box 598, Redmond, WA 98073-0598.

The National Amateur Radio Association is incorporated in the State of Washington and is an exempt organization as defined in Section 501(c)(3) of the Internal Revenue Service Code.

Organization Goals

The National Amateur Radio Association is a nonprofit organization. The broad goal of NARA is to publicize Amateur Radio and to encourage people to become Amateurs by earning an entry level Novice or Technician Class license.

The organization has five specific goals within this broad framework. These are to a) publicize Amateur Radio to the general public, b) attract young people to the Amateur Radio Service, c) increase the stature and benefits of the Novice and Technician Class licenses, d) represent the interests of Novice and Technician Class Amateurs at the national level and e) make all Amateurs aware that our radio frequencies are in jeopardy from commercial interests. More specifically:

A. NARA advertises in various consumer publications to create public awareness of the Amateur Radio Service.

B. NARA is specifically interested in encouraging young people to join our fraternity. A core of young people insures continued growth of the Amateur Radio Service.

C. NARA believes that the Novice and Technician classes are important and respected entry level licenses into the Amateur Radio fraternity. We are committed to increasing its benefits and stature in the Amateur Radio community.

D. NARA is committed to representing the interests of all Novice and Technician Class Amateurs at the national level. We continue to review information from the Federal Communications Commission and submit material to them with the Novice and Technician perspective in mind.

E. Finally, NARA is very concerned that confiscation of frequencies assigned to the Amateur Radio Service will continue. NARA is committed to obtaining new spectrum for the continued growth in numbers of Novice and Technician Class Amateurs.

Membership and Subscriptions

Those joining NARA receive a subscription to *The Amateur Radio Communicator* for a period of one year. The combined cost of membership and magazine is $10.00 per year in all areas with a U.S. ZIP code.

The NARA membership and subscription to *The Amateur Radio Communicator* cannot be separated.

It is not necessary to hold an Amateur Radio license to become a member of the National Amateur Radio Association. The only "qualification" is an interest in radio communications.

How To Contact NARA

National Amateur Radio Association
P.O. Box 598
Redmond, WA 98073-0598

Inquiries	(206)869-8052
Orders only	1(800)GOT-2-HAM 1(800)468-2426
FAX	(206)861-5780
MCI Mailbox	NARANET1
CompuServe	76702,753
Prodigy	MMVT95A
America Online	W6TNS DON

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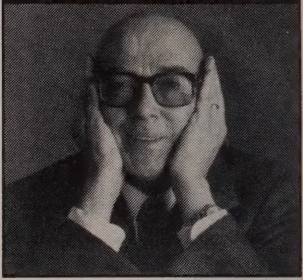


Are You A Second Class Amateur?

by Don Stoner, W6TNS

Those of you who bother to read the fine print on page one will notice that NARA has narrowed and redirected its focus somewhat. There's a reason. In explaining it, let me start with an analogy that is particularly applicable at the moment.

During the political season it is usual for a bunch of candidates to go before the public and tell why they should be President of the United States. They beat up each other (with the help of the press); then during the party convention—a clear winner emerges. Everyone in the political party gets behind the winner (even the losing candidates) to try and beat up the candidate from the opposing party. Before I lose you with this analogy, let's see how it applies to Amateur Radio.

About three years ago, it became obvious our fraternity was in trouble. Our numbers were declining and getting grey around the temples. There was no "new blood" coming in to what was essentially an elderly elitist group. We were so weakened that the FCC thought it could get away with confiscating some of our frequencies. And it did! The FCC took two megahertz of the 220 band for the United Parcel Service fiasco.

In retrospect it was the best thing that ever happened to ham radio. It really put a rocket in our pants! Amateurs finally realized that we had a problem within our ranks. Far-sighted hams, like your modest and humble editor, promoted a no-code class of ham license as a major solution to the situation. Even the staid ol' ARRL dragged its Directors, kicking and screaming, into the 20th century and supported a no-code license. There was a lot of fighting and snarling about the wisdom of a no-code class of ham radio "ticket." We threw verbal punches at each other. But in the end, wisdom prevailed and the majority of Amateurs saw the need for a tool to market ham radio to the general public. The tool was called a no-code license.

As a result of our consensus, the FCC modified the requirements and privileges for the Technician Class license. In February 1991, the no-code Tech license became available to the general public.

THAT SHOULD HAVE BEEN THE END OF THE FIGHT

Everyone should have gotten behind the no-code license and supported it. Unfortunately this has not happened. We are still at each other's throat over the no-code license.

That's where NARA comes in. Some Amateur "dinosaurs" are treating Novices and Techs like *second-class citizens*. Some hams like Mike Whatley, WA4D, call the no-code Tech license an *Amateur Radio affirmative action plan*! Unfortunately there are too many people lurking around the fringes of our hobby, tossing verbal bombs at the no-code Techs, then stepping back out of the melee to watch the blood flow.

I recall when I was first licensed as WN6TNS. My fellow Novices and I didn't have to pass a 13-wpm code test. To become a Novice, the code requirement was only five wpm. As a result, we were not "real hams" and often felt isolated at the club meetings and during Amateur Radio social events. The call letters were a dead giveaway. Everyone knew I was a Novice by my call.

> We are still at each other's throat over the no-code license. That's where NARA comes in.

This time around, it is going to be different. Novices and Techs have no intention of sitting in the back of the Amateur Radio bus! First, no one can tell from your call that you are a "codeless Tech" unless they are crude enough to ask you what class of license you hold. You may alienate the "asker," by telling them it is none of their business, but—it really is none of their business. You hold an entry-level Amateur license. Whether you decide to upgrade and become a "real ham" is up to you. It is your decision and anyone who derides you for not doing so is an Amateur Radio bigot.

We at NARA intend to do everything possible to increase and enforce the stature of the Novice and Technician Class license. We resent anyone or any statement that implies second-class standing for your license class.

We continue to encourage you to upgrade to a higher-license class. At the moment this requires that you be proficient in Morse code. We encourage you to learn the code, not to increase your stature, but with the knowledge that it lets you do more things and have access to more bands.

Morse code is fun. It is a relaxing activity and an interesting area of the hobby. It is also a filter to keep hordes of new Amateurs from adding to the monumental interference on the high-frequency Amateur bands. That's all Morse is, nothing more. It is not the salvation of Amateur Radio. It does not insure that we get Amateurs with the "right stuff." The Morse code is no longer part of the hazing ritual to become an Amateur.

Finally we believe that the interests of Novice and Technician hams may not be adequately represented at the national level. A number of issues are going to arise at the Federal Communications Commission that will require a response stressing the Novice and Technician position. We certainly do not intend to let the FCC confiscate any more Amateur bands! With your help and your membership dollars we can insure that the ranks of the Novice and Technician Class Amateur continue to grow and prosper.

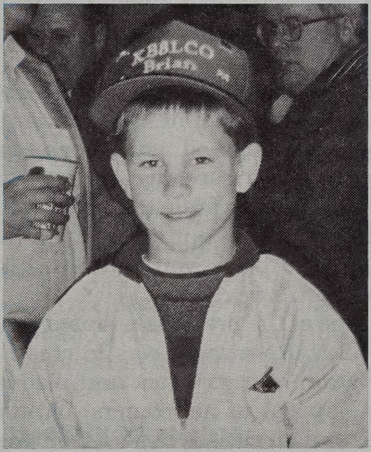
THE FUTURE OF OUR HOBBY

The continued strength and growth of the Amateur Radio Service is going to come from diverse directions. Up until two years ago ham radio was primarily an older white man's hobby. But that is changing. **Each month we plan to publish a "Future of our Hobby" photograph from one of our readers. We would like to receive photos of youngsters, women and minorities for use in this section.** Getting any photographs from you folks is as difficult as "pulling teeth." If you are proud enough of your accomplishments and those of your family, why not take a minute or two and mail us a photo? Tell me about those pictured and we'll probably use it in our "future" section.

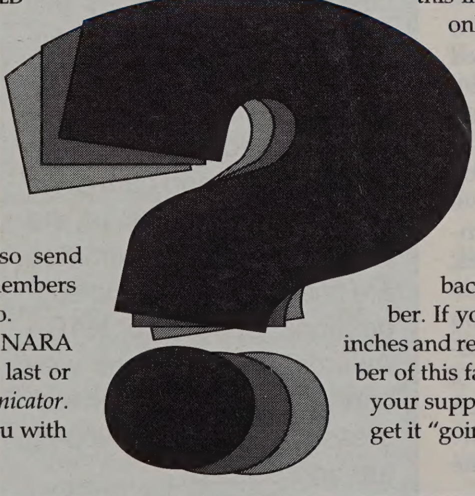
73 Don, W6TNS ❑

THE FUTURE OF OUR HOBBY!

This month's featured Amateur is 11-year old Brian C. Sunderman, KB8LCO, of Cincinnati, Ohio. Brian visited our NARA booth at the Dayton HamVention this year, along with his Dad, Clem, who is KA8QFK. Brian, his father, and his brother, Tim, KB8ENN enjoy being a family of Amateurs. ❑



HOW DID I GET THIS MAGAZINE?



ONE OF THE WAYS WE CAN TELL THE WORLD about the goals and ambitions of the National Amateur Radio Association is to supply complimentary copies to non-Amateurs. We send copies of each issue to hobby shops and science centers, and about 6,000 pieces to newly licensed hams. This magazine is also mailed to a select list of people who might be interested in becoming Amateurs. We also send approximately 10,000 copies to NARA members and prominent people in Amateur Radio.

If your mailing label does not include a NARA membership number, this may be your last or only copy of *The Amateur Radio Communicator*. We would like to continue providing you with this informative publication, but we can only do so if you are a member. For those interested in becoming a ham, or who are newly licensed, a membership in NARA represents an outstanding bargain. A membership, which includes a subscription to *The Amateur Radio Communicator*, is only $10.00 per year.

Check the mailing label on the back cover for your membership number. If you don't see one, look up about six inches and read the benefits of becoming a member of this fast-growing organization. We need your support and so does ham radio. Help us get it "going and growing!"

INTRODUCING!

The NARA-QRP-25 Award

BY - THE NARA AWARDS COMMITTEE
104 PARK ROAD., SUITE #6
WEST HARTFORD, CT 06119

AS PROMISED IN THE last issue of the NARA *Amateur Radio Communicator,* we're very proud to announce the availability of the first of a long series of exciting NARA awards! To start things off with a bang, we invite you to carefully examine the first of these awards, the ***NARA-QRP-25***, featured as our cover photo this issue. We think you will find it as exciting as we do.

One of the previously-stated goals of all NARA awards was to create a program of certificates and plaques that appeal to newcomers, old-timers, and all classes of licensee. We're certain you'll discover in each new issue of the NARA *Amateur Radio Communicator* that the criteria and standards for earning our awards are such that a fine balance is struck between the ease of obtaining the certificate or plaque, and the sense of pride and accomplishment that comes from finally having obtained that last QSL card toward your goal.

Alright, already—tell me more!

Fair enough; we'll do just that. The *NARA-QRP-25* can be earned by any licensee, holding any class of Amateur Radio license, who can confirm, by way of QSL-card photocopies, contact with twenty-five other radio Amateurs anywhere in the world. You must state on your written application that you used a maximum of five watts of output power for each contact, and you *must* supply the NARA Awards Committee with the above-mentioned photocopies.

All NARA Awards Program applications must be sent to:*NARA Awards Committee,* #104 Park Road, Suite #6, West Hartford, CT 06119.

Applications must contain the signed statement as discussed in this article, as well as the $10.00 fee for certificate, *or* $35.00 fee for the plaque. All portions of the application become the property of NARA and cannot be returned. Decisions of the NARA Awards Committee are final. Questions and suggestions about the NARA Awards Program are welcomed. SASEs' (self-addressed stamped envelopes) are appreciated!

Sounds like fun! But what modes can I use?

Ah, yes, the mode-us operate-us. Quite frankly, this is very likely the most exciting aspect of the *NARA-QRP-25* award! You see, we allow any legitimate Amateur Radio mode to be used. If all you have is a Handie-Talkie and a TNC, (or even just the HT, for that matter), that's fine, because both packet and FM voice are certainly valid modes of operation. Besides, we want to encourage you to be both flexible and creative in your Amateur Radio endeavors. Don't forget Amtor, RTTY, facsimile, Slow Scan Television, ATV, and CW; they all count.

Can my contacts be through repeaters?

Absolutely. And QSOs that utilize any combination of satellites, digipeaters, nodes, gateways, Bulletin Board Systems or any other legitimate Amateur Radio relay system, are all fair game to assist you in the quest for the necessary twenty-five QSL cards of confirmation.

Once I make the contacts and get the QSL cards, how do I apply?

We thought you'd never ask! It's all quite simple, actually. Every award certificate offered by NARA has a $10.00 application filing fee. For that $10.00, NARA processes the award, checks the application for validity (just *try* to sneak a packet radio QSL card from 1970 or a two-way confirmation of a satellite contact from 1960 by *us!*), enters the details of your application into our NARA awards database, prepares the handsome certificate, carefully packages it, and ships it off to you.

In addition to the application fee, the NARA Awards Committee requires that you provide the necessary QSL-card photocopies and a signed statement that you made the 25-or-more contacts with five watts or less, as stated previously. See the accompanying box for details on where to send your application.

Wait, didn't you say something about a plaque?

Oops! We almost forgot the plaques. You bet; and these plaques are really the icing on the NARA Awards Program cakes. They're made of heavy walnut, with a clear plexiglass cover to protect your precious certificates—and they're absolutely gorgeous. Best of all, they're not expensive. We've purchased them in quantity to substantially lessen the cost for you, so that even with the extreme expense of shipping something this heavy, ***the total cost of certificate AND plaque is only $35.00.*** This is something that will by itself be the centerpiece of your Amateur Radio shack's wall—truly something to be proud of!

So, what other awards will NARA be introducing?

Well, we can't let too many cats out of the bag, but just to whet your appetites, let's just hint that in the next issue of the *Amateur Radio Communicator*, we'll be portraying the ***NARA-OSCAR-10 award,*** and the following issue will introduce the ***NARA-PR-1000.*** Take your best guesses, folks; but we're not telling until then! ❑

HOT TIPS

Ham Trader Yellow Sheets

Now in its 31st year, this publication is one of the most valuable resources for buying and selling used equipment. Published twice monthly, subscription is only $16.50 annually. Subscriptions: PO Box 15142, Seattle, WA 98115 Ad placment: PO Box 2057, Glen Ellyn, IL 60138

LETTERS

Someone Cares

Hello Don:

Sorry to hear that you were ill. Hope the doctors and the Lord made your recovery and convalescence 100% OK. I understand fully about the delay in receiving the magazine. Whenever I receive it, I enjoy it just the same. So keep up the fine progress. Enclosed is my renewal for three years. So take care and God bless you. 73 for now.

Kelvin Jackson, N9IDC

Thanks for the words of encouragement, Kelvin. They are appreciated. I plan to stick around as long as there are people who want to become Amateurs!

Someone Doesn't Care

My mailbox has a copy of your magazine, The Communicator, May/June 1992. Page three had the question: "How did I get this magazine?" A better question would be WHY? Did you ever think to call it the Gordon West/W5YI ad sheet? Two pages on classroom setup? I had to laugh at the Wayne Green clone doing the editorials? Does "Stoner" ever exhale? Why the Perot on a statue-award? *(Huh? Did I miss something? Editor)* This is not a country where the majority rules? Thank God! So what is the business relationship of NARA and W5YI and WB6NOA? Was the "Clean Air" petition an article or an advertisement? Was it paid for by the Ham Radio Business Council, Inc. or ran as a public service? Who is behind the HRBC?

Terry Murphy, AB4VJ

Like Bill Clinton, Terry never stopped to inhale! I wondered when someone would make the Wayne Green comparison.I've always fancied myself as a younger (much) version...we're both handsome, rich, short on hair, long on opinions and we love ham radio passionately!

We're Doing Something Right!

Dear NARA:

Thank you for sending me the complimentary issue of *The Amateur Radio Communicator*! I have just received my no-code Tech license (KD4MSD), and used *The Ham Radio Handbook* by W6TNS! I attended a class of four other gals and our teacher KD4FEE was also a female. We had four three-hour classes. KD4LNP took her Novice and Tech theory and passed both at the end of three weeks. Two others took the same tests, passed their Novice part, passed the Tech theory later and got their license also! I passed both tests. What a great feeling of accomplishment!! I am working on my code now but kind of have a mental block. I intend to continue studying by attending a code class this fall to complete my goal. My husband is an Amateur Extra, KM4AE and is a VE working with the Ocala and DeLand, Florida radio clubs. Please find my $10.00 for membership and subscription to receive *The Amateur Radio Communicator*!

73 Mary Anne Crandall, KD4MSD

I was really happy to receive your letter, Mary. I hear alot of talk that women are being ignored by the Amateur Radio fraternity. I'm glad to know it's not true, at least in Florida.

Obscenity Revisited

Dear Don:

The filth that masquerades as communications on the ham bands has nothing to do with First Amendment rights. A license is a permission granted by competent authority to engage in an activity that would otherwise be unlawful. In accepting the license, the licensee agrees to follow the regulations that apply to that license. Those restrictions may be restrictive, but no individual was ever forced to apply for an Amateur license.

Just because they have a license does not allow them to use any sort of filth over the air. There is no loss of First Amendment rights in this situation. The way to eliminate filth from Amateur Radio is through the regulations which every licensed Amateur Radio operator voluntarily agreed to follow.

Sincerely, Robert F. Solon ❑

Vertical Antennas

by Terry R. Dettmann, WX7S

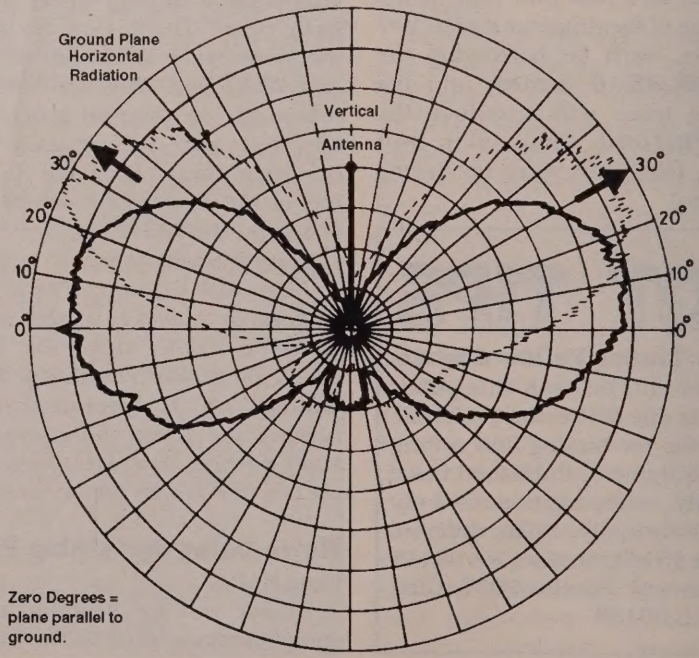
WHENEVER you read about building or installing antennas for an Amateur Radio station, it seems to be assumed that you live far out in the country. The author assumes you have as much space as you need to string any length of antenna you might want. If you're like me however, you live in an area that can't accommodate a horizontal antenna for any high frequencies where Novices operate. Even worse, to hang a horizontal antenna, I need two high points oriented in the right direction. Sorry—I've got a small yard and what I have to do for high-mounting points sends my signal off to Siberia. Not much help there.

I have a long-wire antenna that I tune to whatever frequency I want, but it's usually only for receiving. For real work, whether it's on HF or VHF, I'm afraid all my antennas are vertical. For me they just work. Most Amateurs I've talked to, require vertical antennas for the same reason—they want to operate and don't have enough room to put up a long wire. My primary antenna is a *Cushcraft R7*, but you can build verticals from anything you can build a horizontal antenna with. I've run wires up trees, loaded vertical tubing sections, as well as old CB antennas that I've recut for ten meters. Vertical antennas have some real advantages for DX work since the angle of radiation is very low and it's reasonably non-directional. But I'd sure like to have a beam to throw on those weak ones when I find them. Oh well!

Vertical antennas have some problems though. While you can make a half-wavelength vertical antenna, they're much too long at HF frequencies. It's rather impractical to build one with the kinds of things we can get our hands on. In the HF region, we generally use quarter-wave antennas. But to radiate well, a quarter-wave antenna has to be built with a *ground plane* at its base that acts like a mirror to the radiated signals. This mirror effect makes the antenna *act* as if it were a half-wavelength antenna. On commercial antennas, you will often see radial elements coming out of the base of the antenna to form this ground plane.

A vertical mounted on a car can use the car's body as its ground plane. In the VHF or UHF region, where antennas can be much shorter because of the higher frequency, you can get somewhat better gain and a higher-radiation angle by using a 5/8-wave antenna. If you *really* want to know why, you'll have to go back to a paper published in 1924 in the *Proceedings of the Institute of Radio Engineers* for the theory.

First though, let's invert our formula for the length of an antenna, and think about how we determine the *resonant frequency* of an antenna.



Zero Degrees = plane parallel to ground.

ANTENNA RESONANT FREQUENCY

The resonant frequency of an antenna is the frequency where it would radiate best as a half-wave dipole. Remember that the length of *any* half-wave antenna, whether it's horizontal or vertical, is given by the formula:

$$\text{Length} = \frac{468}{\text{Frequency in Mhz}}$$

If we rearrange the formula, we can get the formula for the frequency that an antenna resonates:

$$\text{Frequency} = \frac{468}{\text{Length in feet}}$$

If we make the length *smaller*, then the frequency that the antenna is for (at which it *resonates*) will *increase*. For example, if the length is twenty-two feet, then it is cut for a frequency of 21.270 Mhz (15-meter band). If I shorten it by six inches (21.5 feet), then its frequency becomes 21.770 Mhz (which is outside the 15-meter band).

The proper length of a half-wave antenna is *always* given by the formula: 468/frequency in Mhz. It doesn't matter whether the antenna is horizontal or vertical. Remember however, that this formula always produces a *half-wave antenna*. These questions deal with the length of a quarter-wave antenna and, as you might expect, are just exactly half the length of a half-wave antenna. Use the formula given above for the half-wave antenna and divide by two. Okay, try the questions about vertical antennas from the Novice examination.

THE QUESTIONS PLEASE

339.
What is the approximate length (in feet) of a quarter-wavelength vertical antenna for 3725 kHz?
A. 20 ft.
B. 32 ft.
C. 40 ft.
D. 63 ft.

340.
What is the approximate length (in feet) of a quarter-wavelength vertical antenna for 7125 kHz?
A. 11 ft.
B. 16 ft.
C. 21 ft.
D. 33 ft.

341.
What is the approximate length (in feet) of a quarter-wavelength vertical antenna for 21.125 kHz?
A. 7 ft.
B. 11 ft.
C. 14 ft.
D. 22 ft.

342.
What is the approximate length (in feet) of a quarter-wavelength vertical antenna for 28.150 kHz?
A. 5 ft.
B. 8 ft.
C. 11 ft.
D. 17 ft.

343.
When a vertical antenna is lengthened, what happens to its resonant frequency?
A. It decreases
B. It increases
C. It stays the same
D. It doubles

344.
Why do many Amateurs use a 5/8-wavelength vertical antenna rather than a 1/4-wavelength vertical antenna for their VHF or UHF mobile stations?
A. A 5/8-wavelength antenna can handle more power than a 1/4-wavelength antenna.
B. A 5/8-wavelength antenna has more gain than a 1/4-wavelength antenna.
C. A 5/8-wavelength antenna exhibits less corona loss than a 1/4-wavelength antenna.
D. A 5/8-wavelength antenna looks more like a CB antenna, so it does not attract as much attention as a 1/4-wavelength antenna.

345.
What type of radiation pattern is produced by a 5/8-wavelength vertical antenna?
A. A pattern with most of the transmitted signal concentrated in two opposite directions.
B. A pattern with the transmitted signal going equally in all compass directions, with most of the radiation going high above the horizon.
C. A pattern with the transmitted signal going equally in all compass directions, with most of the radiation going close to the horizon.
D. A pattern with more of the transmitted signal concentrated in one direction than in other directions.

NOW FOR THE ANSWERS

339.
What is the approximate length (in feet) of a quarter-wavelength vertical antenna for 3725 kHz?
D. 63 ft.
Divide the frequency in Mhz (3.725 Mhz) into 468 to get the length in feet (125.64 feet) of a half-wave antenna. Now, divide this by two to get a quarter-wave antenna (62.82 feet) Round off to the nearest foot and you're ready.

340.
What is the approximate length (in feet) of a quarter-wavelength vertical antenna for 7125 kHz?
D. 33 ft.
Divide the frequency in Mhz (7.125 Mhz) into 468 to get the length in feet (65.68 feet) of a half-wave antenna. Now, divide this by two to get a quarter-wave antenna (32.84 feet). Round off to the nearest foot and you're ready.

341.
What is the approximate length (in feet) of a quarter-wavelength vertical antenna for 21.125 kHz?

B. 11 ft.

Divide the frequency in Mhz (21.125 Mhz) into 468 to get the length in feet (22.15 feet) of a half-wave antenna. Now, divide this by two to get a quarter-wave antenna (11.08 feet). Round off to the nearest foot and you're ready.

342.

What is the approximate length (in feet) of a quarter-wavelength vertical antenna for 28.150 kHz?

B. 8 ft.

Divide the frequency in Mhz (28.150 Mhz) into 468 to get the length in feet (16.63 feet) of a half-wave antenna. Now, divide this by two to get a quarter-wave antenna (8.31 feet). Round off to the nearest foot and you're ready.

343.

When a vertical antenna is lengthened, what happens to its resonant frequency?

A. It decreases

Remember, you *divide* by the length to get the frequency so if the antenna is *longer*, the frequency is *lower*.

344.

Why do many Amateurs use a 5/8-wavelength vertical antenna rather than a 1/4-wavelength vertical antenna for their VHF or UHF mobile stations?

B. A 5/8-wavelength antenna has more gain than a 1/4-wavelength antenna.

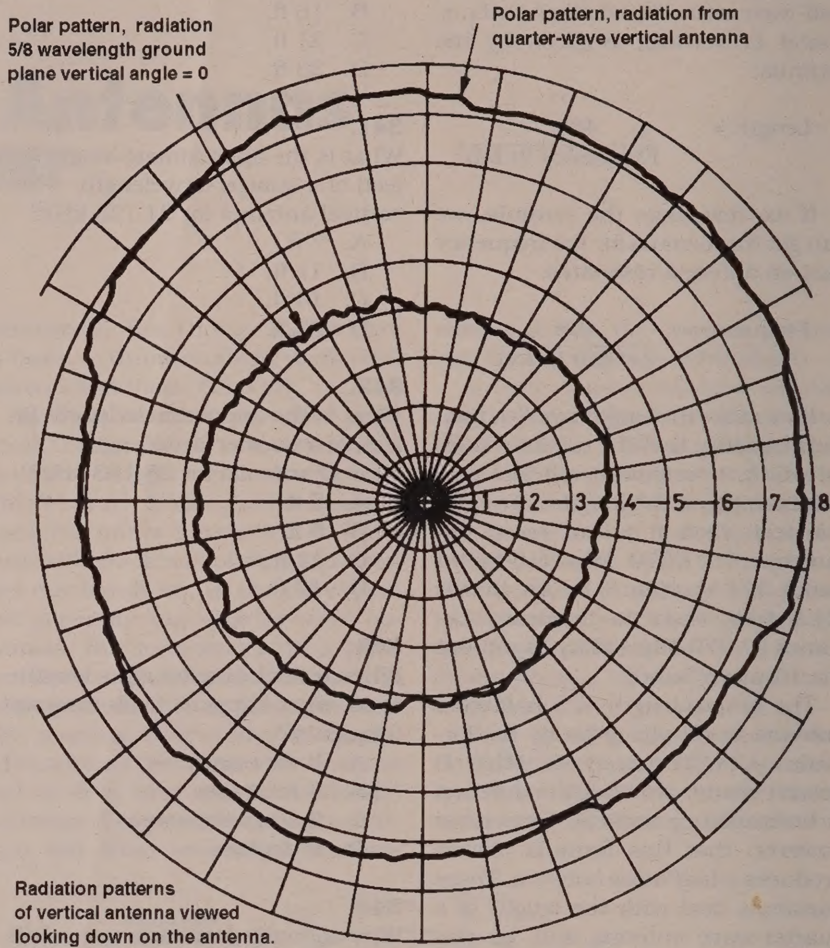
By lengthening the antenna, we get more of our signal out in the air, thereby getting more *gain* from the antenna. With more of our signal in the air, more of it will make its way to who we're talking to and we'll sound *louder* (not for FM signals, but it will assure a more reliable conversation!) It might make the difference between hearing your signal and not hearing it.

345.

What type of radiation pattern is produced by a 5/8-wavelength vertical antenna?

C. A pattern with the transmitted signal going equally in all compass directions, with most of the radiation going close to the horizon

The radiation pattern for a vertical antenna is like a donut centered around the antenna, with the thickest part (most radiation) pointing horizontally towards the horizon.



Radiation patterns of vertical antenna viewed looking down on the antenna.

Did that all make sense? If not, go ahead and drop me a line on Compuserve and I'll try to get back to you. Physical mail will generally take some time to get to me, but electronic mail will get to me right away. My Compuserve ID is 72076,2611.

73 for this issue, Terry, WX7S ❑

HOT TIPS

Amateur Radio Mail Order Catalog and Resource Directory

If you're looking for that specific antenna, a listing of worldwide radio clubs, or that perfect gift for the ham in your life, this remarkable 236-page book contains more than 1,500 entries of catalogs, companies, services, clubs and much more all devoted to serving ham operators. Priced at only $12.95 (3.00 S&H) this resource directory is an absolute must for every ham shack! See the front of this listing for further information.

THE • ADVENTURES • OF

Dan & Burke

Meet The Dog Psychologists

"A fine reward for a whole day spent climbing up and down hills, over fences, and through bogs," Dan said ruefully as he held up an onion sack containing four scrawny, brown-tinged sponge mushrooms. He and Burke were sitting on Burke's back steps resting after a not-too-successful morel-hunting expedition.

"Yeah, and the disgusting part is that tonight's paper is almost sure to have a picture of some joker, holding a dishpan full of king-size mushrooms that he just happened to stumble over as he was digging a posthole, burying the garbage, or doing anything else except actually looking for mushrooms," Burke added gloomily.

"I suppose we walked right past a truckload of morels today if we only knew it," Dan reflected. "They certainly are hard to see snuggled down in the leaves and grass. What a guy needs is some device that will sniff them out."

He was interrupted by a gentle snore, and the eyes of both boys turned to where Bosco, Dan's dog, was stretched out flat on his back, asleep. His twitching hind legs were sprawled out, and his front paws were curled limply. Bosco had had a hard day protecting his young masters from vicious rabbits, squirrels, field mice, turtle doves, and other similar dangers. Now, with them safe at home, he was taking a well-earned rest. Dan answered the question in Burke's eyes with a shake of his head. "No, not old No-Nose Bosco, who couldn't smell scorched hair if his tail was on fire," he said sadly. "Bosco doesn't know a dog is supposed to have a keen sense of smell. In fact, I don't think Bosco knows he's a dog at all. Who ever heard of a dog sleeping on his back and snoring?"

"Let's not give up so easy," Burke demurred. "Remember we taught him to find an artificial bird quicker than a trained bird dog could do it. Maybe we can teach him to find mushrooms the same way."

"I doubt it. Raw mushrooms are one of the few things he won't eat, and it's difficult to interest Bosco in anything he can't eat or chase."

"Maybe we can give him a conditioned reflex," Burke suggested.

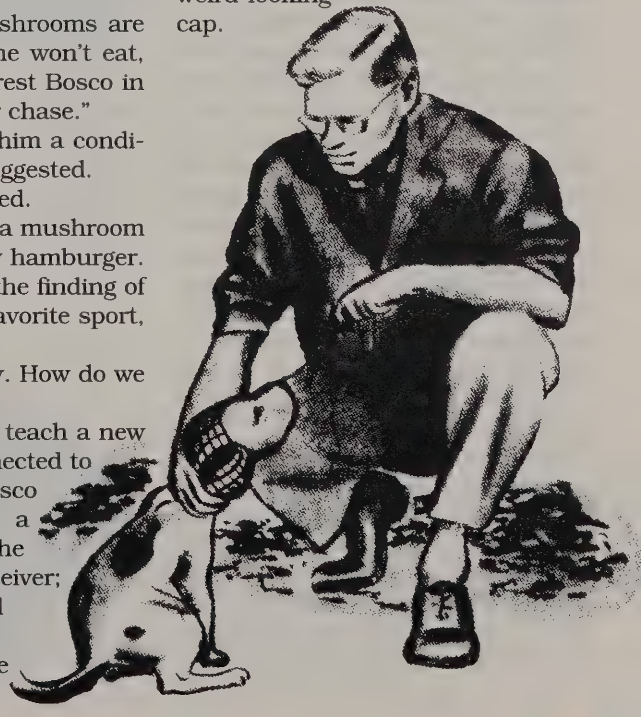
"Like how?" Dan asked.

"Every time he finds a mushroom we'll give him some raw hamburger. In time, he'll associate the finding of a mushroom with his favorite sport, eating."

"Well, it's worth a try. How do we start?"

"It's always easier to teach a new lesson that can be connected to one already learned. Bosco has been taught to find a hidden transmitter by the sound he hears in a receiver; so let's start there. We'll fasten on that special Sherlock Holmes cap we made for him and hide the transmitter under some leaves, and then we'll pull one of these mushrooms on top of the leaves. When the increased sound from the transmitter brings him to the mushroom, we'll grab him and give him some hamburger. You wake up Sleeping Beauty, and I'll get the stuff."

Dan awakened Bosco by unceremoniously grabbing him by the hind legs and turning him in a backwards somersault onto his feet. One thing in the boys' favor was Bosco's excellent memory. He demonstrated his memory by promptly bolting for the alley when he saw Burke emerge from the basement laboratory with the weird-looking cap.



Dan brought him down with a flying tackle however, and soon the dog's head was encased in the headgear that looked like a Sherlock Holmes fore-and-aft hat worn sideways so the flaps could be tied firmly beneath his chin. A small single-chip receiver was in the crown of the cap, and earphones in the flaps carried the tone-modulated signal from the transmitter right to Bosco's sensitive ears.

While Dan was putting the cap on the dog, Burke had been busy concealing the miniature transmitter under some leaves down by the garage. A lone mushroom was placed just above it. When Bosco was released, he started quartering the back yard just as he had been taught to do when he was searching for the transmitter concealed in an artificial "bird."

Guided by the waxing and wining of the sound as he moved closer to or farther away from the transmitter, Bosco soon came to a halt directly in front of the mushroom. At this instant Dan grabbed his collar and held him until he barked with impatience. At the first bark Dan crammed a pellet of hamburger into the surprised dog's mouth.

In spite of his rather stupid appearance, Bosco was actually a very smart dog; and he got the idea quickly. In a matter of minutes he was seeking out the mushroom and barking at it until he was fed. Next, the boys started cutting down the volume of the sound heard in the earphones, but Bosco still found the morel. Finally the cap was removed entirely, and the dog still searched out the mushroom purely by sight. Even when Dan and Burke made the mushroom increasingly hard to see by piling leaves on it, pushing it down in the grass, and so on, Bosco managed to find it every time.

"I say he's ready," Burke declared as he brushed the last crumbs of the hamburger into the eager jaws of the dog. "Anyway, we've about worn out all four of our mushrooms. Now comes the sixty-four dollar question: Will Bosco find wild mushrooms in their native state? What say we find out tomorrow morning? Let's get started about six and see if we can't find some of the mushrooms that have popped up overnight."

"Good deal," Dan agreed. I'll get a pound of fresh hamburger tonight and be all set at six in the morning. As for you, Bosco, you'd better get to bed early and get a good night's sleep. You've got a big day ahead of you tomorrow whether you know it or not."

The rising sun issued in a beautiful spring day the next morning, and the two boys and the dog were headed for the country by a few minutes after six. About a mile from the edge of town, they came to a field that had a grove of trees along one side, and there was a wide area next to the trees polka-dotted with tree stumps.

"This is the place," Burke announced. "My grand-father always says that 'new ground,' especially around a beech stump is the ideal place for mushrooms to grow. There are lots of beech trees in that grove; so some of those stumps are almost certain to be beech."

Bosco was grabbed up and tossed over the fence; then the two boys clambered over and walked across to the stumps. Just as they reached the edge of the grove, a heavy-set, red-faced man carrying a stout stick in his big hands stepped from behind a tree.

"Where do you two think you're going?" he challenged.

"Why, why, why, nowhere," Dan stammered.

"That's what you think," the man said menacingly. "You're going to jail. I'm sick and tired of trespassers who ride down my fences, leave my gates open, shoot my horses and cows, and litter my land. I'm going to make an example of you two."

"We didn't do any of those things," Burke said. "We didn't know you didn't want people in here."

"Oh, no; you didn't know!" the man mocked bitterly. "You couldn't read the **'Trespassers Will Be Prosecuted'** signs posted every hundred feet all around my property. Turn around. You can see the backs of three of those signs from right here."

He was right. Three signs could be seen. The boys had climbed over the fence between two of them.

"Honest, mister, screwy as it sounds, we didn't see those signs," Dan said earnestly. "I guess we were too interested in trying out our mushroom dog to think about anything else."

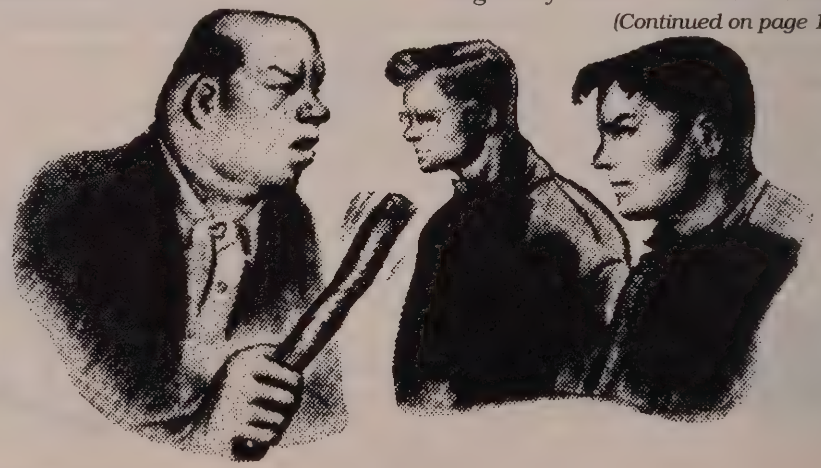
"Your what?" the man said incredulously.

"Mushroom dog," Dan repeated. "We think we've trained him to hunt mushrooms, and we were just going to try him out."

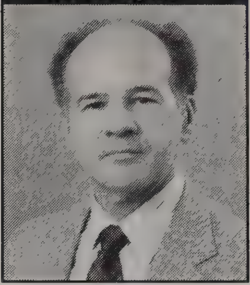
"Now I know you're going to jail," the man said with renewed determination. "Trespassing is bad enough, but lying is worse. Mushroom dog indeed! I'll teach you young punks to try to make a fool of me."

"But we're not lying!" Burke said indignantly. "We've trained the dog

(Continued on page 13)



Fred Maia, W5YI



National Volunteer Examiner Coordinator

From The Mailbag... We Get Letters...Lots of Letters!

SINCE WE ARE on the staff of several publications, our mailbox is constantly filled with letters from people wanting to know more about ham-radio topics, how they may participate, and the Volunteer Examiner (VE) program. The following questions are representative of our mail.

Why doesn't the FCC administer the Amateur Radio operator-license tests any more?

Due to a lack of manpower and financial resources, the FCC began turning the Amateur testing program over to the Amateur community in 1983. They believed that hams could do a better job of it and at no cost to the U.S. taxpayer. There are eighteen-different coordinating organizations, called Volunteer Examiner Coordinators (VEC). VECs act as the liaison between the FCC, who issues the Amateur Radio operator licenses, and the VE who administers the examinations.

What are the Amateur Radio examinations like?

Each VEC furnishes its VE teams with testing materials and detailed instructions on how to conduct the test session. There are two types of tests: multiple-choice written examinations and Morse code tests. Depending on the license class, the written exams contain between twenty-five and fifty questions that are selected from large "pools" of questions that cover nine-different subjects. These topics range from ham radio practices, to basic electronics, to rules and regulations.

There are no "secret" questions. All are public information and widely published—including the correct and incorrect responses. It is simply a case of reviewing the questions, answers and explanations contained in a study manual available for that particular license class—and then taking the test.

There are eight-different examinations, five written and three telegraphy (Morse code.)

License Class	Total Questions	Pass Mark	Telegraphy Test
Novice	30	22	5 wpm
No-Code Technician	55	41	none
Technician-Plus	55	41	5 wpm
General	25	19	13 wpm
Advanced	50	37	13 wpm
Extra	40	30	20 wpm

The written exams are constructed from five pools of questions. There is a question set for the Novice, Technician, General, Advanced and Extra Class levels. You must pass each of the written tests in ascending order of difficulty. If you are applying for a Codeless-Technician ticket, either the Novice or Technician written exam may be taken first. No written examinations may be skipped, however. That means you can't become a General class operator without first passing the Novice five-words-per-minute code and the Novice and Technician written tests.

Volunteer Examiners have more latitude on the telegraphy examinations. The tests consist of transcribing text sent during a five-minute run of Morse (CW) code, at speeds of 5,13 and 20 wpm. The text usually takes the form of a typical on-the-air CW contact. The rules give the VEs a lot of latitude in determining the answer format of a telegraphy exam. One-minute solid-copy, answering seven-out-of-ten questions, multiple choice and fill-in-the-blank code tests are all authorized. The only determination a VE must make is whether or not the applicant can determine what is being sent at a particular speed.

We now have two entry levels; the Novice and the code-free Technician. The Codeless-Technician written test consists of the thirty-question Novice and twenty-five-question Technician examinations. As the name suggests, there is no telegraphy examination. The Novice exam is known as Element 2, and the Technician; 3(A). This class has only been available since last year and has proved to be very popular! There are more Codeless-Technicians than any other class. You must correctly answer questions on Element 2 and 19 questions on Element 3(A) to qualify as a Codeless-Technician. A credit certificate is issued if you pass one element and not the other. This enables you to take only the failed portion of the Codeless-Technician requirements later.

Why is Morse code required if it is becoming outdated?

It is only a matter of time before Morse code will be abolished for all ham-license classes. The Amateur Service is global in scope. It exists in nearly every country—and on the same frequencies that must be internationally coordinated—otherwise hams would not be able to talk to one another.

The nations of the world have agreed on minimum qualifications for ham operation. It is an international requirement that Amateur radio operators must be proficient in the Morse code when their communications take place at frequencies below 30 MHz. That means you must know the code even if you only intend to transmit in the voice mode on the worldwide high-frequency bands. The new Codeless-Technician ticket only authorizes communication privileges above 30 MHz.

The code requirement goes back to the days when telegraphy was important for emergency use—especially on the high seas. The decision to abolish the Amateur-code requirement must be collectively made by the nations attending a World Administrative Radio Conference (WARC) that considers the Amateur Service. General WARCs are held about once every twenty years. The last took place in 1979 and it could be several years before the Amateur-telegraphy requirement is considered.

Does the Codeless-Technician Amateur class yield beneficial privileges?

Most decidedly, yes! It is not a limited license class by any means—like the Novice level. *Codeless-Technicians have all Amateur privileges above 30 MHz.* This means they may participate in two-way communications in any mode at the six meter (50 MHz) and higher-frequency bands at full Amateur power levels. This includes the popular computer-to-computer, satellite and FM repeater modes. It is a fact that most Amateur communications today take place at the VHF/UHF level.

Packet, radio-computer communications using radio modems instead of the phone lines, are particularly fashionable these days. And easy-to-do two-way satellite operations are just now reaching the beginner. It won't be long before you will be able to talk internationally using just an inexpensive handheld transceiver. Two-meter (144-148 MHz) repeater communications, the most widely used ham band, is also available to Codeless-Technicians. You are a "mainstream" ham with a Codeless-Tech ticket! Most of the expansion in ham-radio technology is taking place above 30 MHz and code-free Techs get to participate.

It won't be long before you will be able to talk internationally using just an inexpensive handheld transceiver.

Why does the Amateur Service exert so much control over what you say over the air?

This is a very complex legal question indeed—one that is subject to interpretation! By law, the Amateur Service must remain just that—Amateur. Ham radio is to business telecommunications what being a private pilot is to commercial aviation. Simply stated, Amateur Radio is a hobby—a personal pastime. Just as private pilots are prohibited from charging air fares, the international law precludes using Amateur Radio as a substitute for available public telecommunications. Ham radio also may not be used as a replacement for other available radio services.

Unless an emergency exists, phone "patches" on the ham bands are even technically illegal since cellular radio is widely accessible. You can't use Amateur Radio's capacity to save or make you or your company money. Still, phone patches on the ham bands are permitted as long as no "commercial business" is transacted. Even many volunteer-communications activities are prohibited such as assisting local police (since public safety agencies have their own radio frequencies) or using ham radio in the classroom where the teacher is routinely paid.

Part (97.119) of the U.S. Amateur Service regulations specifically deals with content of transmissions. In short, you may not promote business over the airwaves—direct or indirect. The word "business" is used in its widest context and even extends to non-profit organizations. Ham gathering "talk-ins" where Amateurs give directions to a hamfest are actually illegal—since they are coordinating a function that has an admission charge.

You can't make a doctor's appointment, call in late or sick at work, or order a pizza on the ham bands. But it might be all right to ask your wife to do them for you, either by phone patch or if your wife is a ham. And it is probably okay to ask your wife if she needs a loaf of bread while you are driving home. Again, it is all very "fuzzy." It is often difficult to locate the line between personal and business communications.

There are many things you can't do. Ham radio may not be used in broadcast news gathering or production. Music, deceptive signals, and obscene, indecent or profane language are also expressly prohibited. And you can't retransmit programming from any other radio station other than an Amateur station. Having said that, we must tell you that there are several authorized exceptions in the rules.

On the other hand, broadcast stations are allowed to broadcast "indecency" during certain hours of the day when children might not be expected to be in the audience. But not ham stations—at least not according to existing regulations. Some people believe some of the ham communications content rules infringes on their First Amendment (Freedom of Speech) rights. But it has really never been pushed in the courts.

It has become so confusing, that the government is now in the process of studying communications content in the Amateur Service and a new proposal from the FCC is expected momentarily. Basically they are expected to suggest a system of primary and secondary communications.

Secondary communications such as assisting government and public service agencies, the news media, non-profit businesses, classroom instruction, voluntary-logistic support to various races, parades could all become legal—even transacting personal business on the ham bands. Amateurs would still be prohibited, however, from selling a communications service that uses Amateur frequencies.

73, Fred, W5YI ❑

Fred Maia, W5YI
National Volunteer Examiner Coordinator
P.O. Box 565101
Dallas, Texas 75356

DAN AND BURKE

(Continued from page 10)

to hunt mushrooms."

"All right. Have it your way. Let's see him find one," the man challenged. "If he does, I'll believe your story. If he doesn't, you're going to jail."

That was all the break Dan and Burke could expect. Dan took a very withered mushroom from his pocket and placed it on the ground in front of the grinning Bosco who had been sitting quietly on his haunches during the conversation. At the same time Dan passed the packet of hamburger tantalizingly back and forth in front of the dog's near-scented nose.

"We have to sort of prime him," Burke explained apologetically to the grim-faced man.

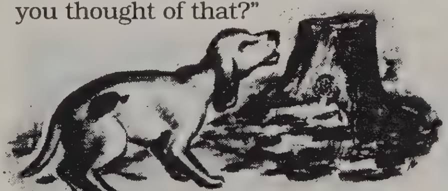
"Okay, Bosco, let's see you do your stuff", Dan was whispering prayerfully into the lopping ear of the dog. "You find a mushroom and I'll buy you the sweetest steak in town to go with it!"

Bosco rose to his feet and tore off at a gallop. Madly he scampered in dizzy circles around the stumps. Suddenly he came to a halt and barked excitedly. All three rushed to his side and beheld him barking at a whole clump of mushrooms pushing their way up through the rotting leaves.

"Well, I'll be a monkey's uncle!" the farmer exclaimed as he watched Dan pop a generous handful of hamburger into the drooling jaws of the dog. "Go ahead and pick them. Can he do that again, or is he a single-shot instead of a repeater?"

In answer Dan waved the dog on, and once more Bosco started his apparently aimless circling. In less than a minute he was barking at another huge sponge mushroom growing right between the roots of a stump. (They call this "treeing.")

As the farmer watched the dog gulp down another patty of hamburger, he remarked anxiously: "At this rate he'll be full of hamburger before that onion sack is full of mushrooms. Have you thought of that?"



"Not old Bosco," Dan denied. "His other name is 'The Bottomless Pit.' He can eat hamburger until you'd think it would be sticking out of his ears and still beg for more."

"Good!" the farmer exclaimed. "In that case I want to ask a favor of you boys. Will you wait until I hop across the grove to the house and get my VHS camcorder? I want to get a picture of that dog treeing a mushroom. Here's why: When I was a boy I also had a dog that would hunt mushrooms. I didn't train him; he just seemed to pick it up himself; but he hunted almost exactly the way Bosco does."

"About a week ago I was trying to tell some of the fellows at a meeting about that dog of mine, and they laughed me right out of the hall. Now, if I can just get a good shot of Bosco doing what I tried to tell those smart-alecks my dog would do, you-know-who is going to have the last laugh. Will you help me?"

"You bet!" the boys said in chorus.

"Okay, I'll be back in two shakes," the farmer said as he started off at a run. "My name's Walt Downham," he called back over his shoulder; "and you two are welcome on my land any time you want to come."

Hey! He's a real nice guy," Dan said as he clamped the squirming Bosco between his long legs. "Sure is funny how a guy that looked so mean and threatening a few minutes ago can look so kind and pleasant now, isn't it?"

"Yeah," Burke agreed thoughtfully. "I guess it just goes to prove that we tend to see people the way we want to see them instead of as they really are. I'm going to remember this and try to make myself take a second look the next time I meet someone I think I dislike."

"Me, too," Dan said as he watched farmer Downham running toward them with his camcorder in his hand. ❑

HOT TIPS

New Wireless Pioneers
Box 398, Elma, NY 14059
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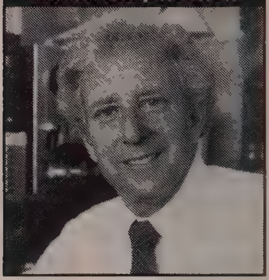


Gordon West, WB6NOA

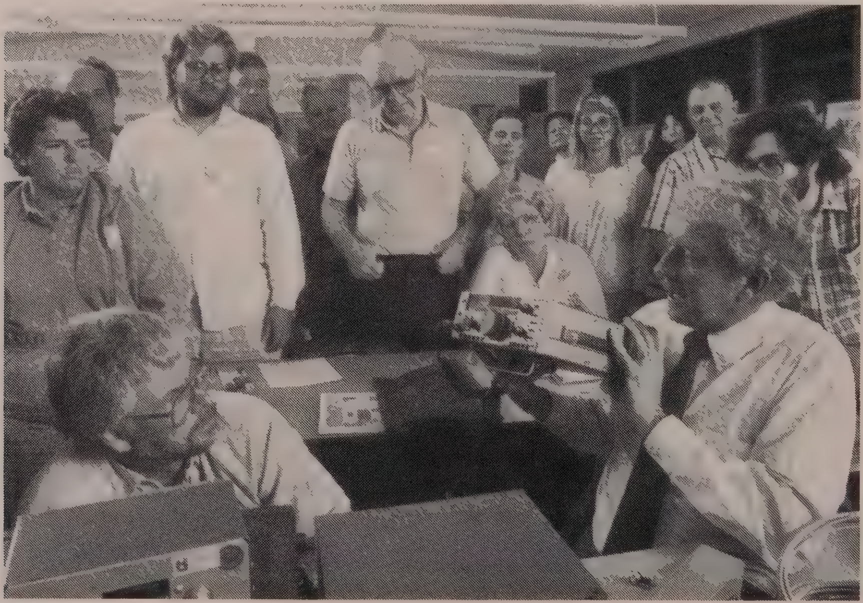
Teaching The Ham Class

by Gordon West, WB6NOA

Live classroom demonstrations make learning more fun and interesting.

You can dazzle your class with a miniature Tesla coil. The high-voltage snap can be heard throughout the classroom, and it's a great way to illustrate lightning, static discharge, and the importance of good grounding. You can find these demonstration-Tesla coils advertised in *Nuts & Bolts Magazine* (430 Princeland Court, Corona, California 91719).

For grounding, bring in a copper ground rod, as well as ground foil and ground strap. Tell the students the importance of a good surface-area ground. Caution your students not to use round wires for grounding—the wires have reactance at RF frequencies. You may wish to hold up a round wire, and then hold up a round coil, and briefly discuss the effects of inductive reactance.



Pass around a handheld radio, and let students operate as third-party traffic. Caution them not to hold the antenna near their heads. Students have a lot of fun, getting on the air for the first time, as a third party. Re-emphasize the importance of keeping the antenna away from their eyes when transmitting.

Bring in a hard hat, safety glasses, and a tower-climbing safety belt. You might also dig out an old leather belt, or an old pair of leather shoes, too. Bend the leather back and forth, and illustrate to the students how leather can crack, and why a leather climbing belt is absolutely dangerous.

In the Novice syllabus, you will find SWR in the middle of Amateur Radio practice. Take that SWR section, and move it up to antennas and feed lines. That's where it belongs, and that's when you'll want to discuss SWR. Skip it for right now.

You can have a lot of fun with TVI. If there's a TV in the classroom, transmit into a lightbulb, and let the students hear the sounds of SSB coming over the TV set. This graphically points out the effects of front-end overload. You may even find that it disrupts the normal playing of a VCR player, too. Many times it will dramatically change the speed, and students will always get a big laugh out of that.

An oscilloscope is a good way to demonstrate harmonics. You could also bring in a harmonica, just for a laugh. Even an audio-tone generator is a good way to demonstrate harmonics. Pass around a 3-wire AC plug with the wires protruding out. Have the students demonstrate the green wire for ground, the black wire to the fuse, and the white wire to the transformer primary winding.

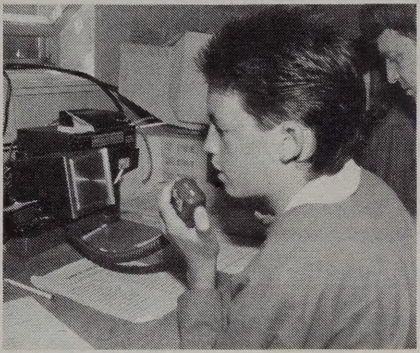
Point out the safety aspect of voltage and current. Review those questions out of the book that talk about volts and amps that can kill you. Drive home this point by sparking a capacitor, just to get their attention. You want to make absolutely sure that every student knows that just a few volts or a few amps can kill them if it passes through their body, going through their heart.

In the Technician question pool section on Amateur Radio practice, it also covers SWR, dummy loads, and the trans-match. Take this entire section, and group it with antennas and feed lines. We'll cover that later.

For electrical principles, pass around resistors, capacitors, coils, variable resistors, variable capacitors, diodes, and just about anything else that looks interesting. Once every student has an electronic part, have them stand up and say everything they know about this part in twenty seconds. Then relate the part to what questions are asked about it in the Novice and Technician questions.

I like to demonstrate voltage, current, resistance, and Ohm's Law with a small gel cell. I run the current through an automobile 12-volt lamp. I let the students come up and make voltage checks, and current checks, with a multimeter. The class may coach them, but they must interact with the circuit properly in order to see voltage or current. I introduce resistance, and allow them to see the brilliance of the bulb decrease, and the resistor get hot. Real hot!

I then take out my extra-cheapo test lead, made out of #18 stranded wire. I put on my safety glasses for the following experiment. I purposely short out my gel cell with this tiny test lead, and you can imagine what happens—it immediately starts smoking. I'm cautious only to do this in an area that there is absolutely no fire hazard, nor under any local smoke detector. I hold the lead on just long enough to get it hot and smoking. It's an impression that students will never forget. You can then point out the importance of a fuse, as well.



Live classroom demonstrations are an absolute *must*!

Another demonstration of current, voltage, and resistance is the blazing pickle. I impale a pickle onto two probes hooked into 110-volts AC, with in-line fuses rated at two amps. I momentarily switch the circuit on with the pickle connected, and the pickle immediately blazes away on the inside, sputtering and giving off some light smoke. I do this long enough just to let the students see that current can flow in almost anything, including a pickle. This is the same principle you probably all did years ago when you cooked a hot dog out of a light socket. Remember that one?!

VERY IMPORTANT—Always keep students away from any live voltage experiment. Never leave anything turned on after the experiment is over. Always remove the equipment completely so inquisitive students won't duplicate what you were doing during class.

For resistors and capacitors in series and in parallel, I use very large resistors with big numbers on the side so students can actually see how these things get hooked up in a circuit. The numbers are big enough to be seen all the way in the back of the room. Students then have a much better idea of how resistors and capacitors combine in circuits.

Finally, I turn on my audio generator again, and demonstrate audio frequencies from 20 Hz to 20,000 Hz. I then go in for some chalk talk, illustrating that the higher the frequency, the shorter the wavelength, and the relationship between frequency and wavelength. Before I let the students go home, we work out the formula for MHz to meters, or meters to MHz. After we are through, they well know the importance of the number "300."

Bringing all of this gear into the classroom is a major effort. It's even a bigger problem if you must set up and tear down for each individual-class session. Live classroom demonstrations are an absolute *must*. If you are talking about resistors, and don't show them the different types of resistors up close, you are merely teaching your students how to robotically get through the exam. This is not good. We need to train our new students all about the wonderful world of ham radio, and show this equipment and these components up close.

Even though there's not a single question about how to read the color code on a resistor, you should nonetheless teach this very important aspect of circuit components. Although they won't find a single question on the test regarding how many ohms for a particular color code, they will at least have an idea of what those colors are all about on the side of the small resistors.

73 from Gordon, WB6NOA ❑

Shuttle Amateur Radio Experiment (SAREX) Fact Sheet

STS-47 Space Shuttle Endeavour

When:	Mid-September 1992 for six days of two-meter operations.
Where:	Earth Orbit. Altitude 300 kilometers, with radio coverage of latitudes from 70-degrees North to 70 degrees South.
Operators:	Dr. Jay Apt, N5QWL and Dr. Mamoru Mohri,7L2NJY. N5QWL is the flight engineer for STS-47 and will operate the shuttle systems during the "night" shift, while 7L2NJY will be one of the scientists performing experiments in a laboratory in the shuttle's cargo bay during the "day" shift.
Modes:	FM Voice
Voice Call Signs:	N5QWL and 7L2NJY

Packet (beacons giving daily mission activities by N5QWL, daily if I get a chance, and robot QSOs - successful connects will be issued a contact number by the robot)

Packet Call Sign: W5RRR-1

Frequencies:	We will operate split. ***Please Do Not Transmit On The Downlink Frequency!***
Voice:	Downlink (shuttle transmits) on 145.55 MHz Uplink (ground transmits) on 144.95, 144.91, 144.97 (except over Europe) - we'll listen on those three frequencies to spread out the pileup a bit.
Packet:	Downlink (shuttle transmits) on 145.55 Uplink (ground transmits) on 144.70 (worldwide)

If you can, decrease your radio's deviation to 3 KHz (most are initially set at 5 KHz) and compensate for the Doppler shift. If you cannot, wait until a minute or 90 seconds after we come over your horizon to transmit - that will put you within our IF. If a station transmits without following these suggestions, we just hear what sounds like a noisy carrier. The above applies to both voice and packet.

QSL via: N5QWL, 806 Shorewood Drive, Seabrook, Texas 77586 USA. Include a self-addressed stamped envelope (SASE). Non-US stations include a self addressed envelope with $0.50 of US postage affixed or appropriate IRCs.

Include the Callsign worked, date, UTC, mode, and frequency. For packet contacts, include the QSO number issued by the robot.

SWL QSL's: Include the Callsign heard, date, UTC, mode, and frequency.

Information during the mission: AMSAT bulletins, Compuserve, Genie, Prodigy, local packet bulletin boards, ARRL bulletins, and HF voice from NASA Johnson Space Center ARC, Houston, Texas, W5RRR, or NASA Goddard Spaceflight Center ARC, Greenbelt, Maryland, WA3NAN, the frequencies listed below.

W5RRR may be found on or near: 7.215, 14.280, 21.360, and 28.400. WA3NAN retransmits NASA Select Audio and SAREX bulletins simultaneously on or near 3.860, 7.185, 14.295, 21.395, and 28.650.

The NASA Info BBS at Johnson Space Center, Houston, will also carry Keplerian elements and SAREX bulletins. (713)483-2500, 1200 baud, 8-N-1. At the *enter number prompt*, type 62511 <return> and log onto the BBS. The Keps and bulletins will be in the welcome message. Disconnect rapidly to facilitate access by others.

OPERATIONS NOTES:

N5QWL will be asleep over most USA passes, and 7L2NJY will be busy with laboratory duties for most USA passes, so try us on packet over the USA. Remember, our packet call sign is W5RRR-1. We'll try to work voice (1) when we are not otherwise engaged, and (2) at night or when the ground is cloudy (we are generally busy taking pictures of the Earth during clear daylight passes). Our orbit will carry us over the northern hemisphere in daylight.

We plan to work six schools on this mission: two in the USA, three in Australia, and one in Europe or Africa.

We do not plan any orbiter maneuvers after the first six hours of the flight, so orbital elements obtained early in the flight ought to be pretty good for the entire flight. If I can get to it, I'll activate the SAREX about three hours into the mission; deactivation will occur at about six days, eight hours after launch.

The orbiter attitude is planned to be tail down, payload bay south. The SAREX antenna will be in the right forward window, so most contacts should have a good antenna pattern from AOS to TCA (time of closest approach). *73, Astronaut Jay Apt,N5QWL* ❑

HOT TIPS

The Technician license continues to gain stature. If you plan to be an astronaut on a shuttle flight, you no longer need an Extra Class Amateur license to communicate from space. Section 97.7 of the FCC Rules and Regulations has been modified so that astronauts need only a Technician class license to work two meters while in orbit.

AVAILABLE FROM NARA

The Ham Radio Handbook

By Donald L. Stoner, W6TNS, is the leading book for anyone wishing to earn the new code-free Technician license. Includes every question plus the multiple-choice answers.

The Ham Radio Handbook is the only test manual that explains in detail why the correct answer is correct. Includes simple and easy-to-understand theory along with many photos and illustrations. There are ten chapters covering each subelement. Sample tests are given at the end of every chapter with a list of correct answers at the back of the book. Guaranteed to provide all the information needed to get your ham radio license or your money will be refunded. ***The Ham Radio Handbook*** is only **$9.95 ($2.00 S&H)** #B610.

FCC Rules and Regulations

The FCC, Rules and Regulations Part 97, covers the guidelines and rules of the Amateur Radio service. This 60+ page book is an excellent reference for every class of license; a resource book no ham shack should be without! ***Rules and Regulations, Part 97, Amateur Radio Service*** is only **$4.95 ($1.00 S&H)** #B640.

NEW!

All About Ham Radio

This is the book that Don Stoner wishes he had written. Harry Helms, AA6FW, wrote this book in a manner that can be understood by everyone from young to old alike. Although not keyed directly to the question pools, it provides all the information you need to know to become a Technician Class Amateur.

Over 290 pages of jam-packed information including Hams And Their Radios, Customs, Habits And Other Good Stuff, Single Sideband, Ham Radio Meets the Personal Computer, Folklore, and much more.

For a book that covers so many different aspects of the Amateur radio hobby **All About Ham Radio is a steal at only $19.95 (3.00 S&H).** #B680

Order Today!

UPGRADE! Shows You How Easy It Is To Upgrade!

UPGRADE!, by Donald L. Stoner, W6TNS, shows "no-code" hams how easy it is to upgrade to the Tech-Plus or General Class license!

UPGRADE! was written to encourage learning, rather than memorization. There are nine chapters covering each subelement of the General Class exam. All multiple-choice questions and answers for the General Class exam are included. Every chapter provides you with simple-to-understand discussions explaining the theory behind each exam question.

Fred Maia, W5YI, and Gordon West, WB6NOA, provide their favorite tips on learning Morse code to help you avoid the dreaded "speed plateau" at 8 to 9 words-per-minute.

UPGRADE! is available from all major Amateur Radio equipment stores, or you can order direct from NARA for only **$9.95 ($2.00 S&H)** #B620.

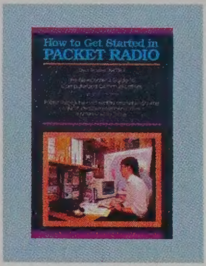
Play It Up! With NARA's New Videotapes

Explore Amateur Radio through exciting videotapes! Directed by some of the best-known names in ham radio, these videotapes are the perfect addition to every ham's collection. They are also excellent to get children motivated about the hobby or to help you polish your skills as an instructor. Choose from the following:

Reading, Riting' and Radio! Featuring well-known educator, Carole Perry, WB2MGP, with her students and ham radio classes for children, this tape will help motivate your student, child or class. This video shows just how beneficial and exciting ham radio is in the school systems for teaching geography, world affairs, current events, math and more. **The Reading, Riting' and Radio videotape is only $19.95 ($3.00 S&H).**

CQ Field Day! Designed to help hams who want to set up their equipment in the great outdoors, this tape takes you to the award-winning 22A Field Day station. It shows you everything from setting up to packing up a Field Day station. This tape is ideal for clubs, contest committees or the ham who wants to know more about Field Day events. **The CQ Field Day videotape is only $19.95 ($3.00 S&H).**

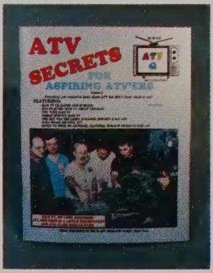
Ham Class. Well-known instructor, Gordon West, WB6NOA, helps prepare students and instructors to set up an upcoming ham class. The tape contains live classroom demonstrations and tips on setting up classes or training seminars. **The Ham Class Instructional Video is only $19.95 ($3.00 S&H).**



NEW!

Packet Radio For Beginners

NARA has done it again with *How To Get Started In Packet Radio* written by well-known author Dave Ingram, K4TWJ. This informative new book explains the practical side of packet radio in a simple-to-understand manner. It begins with a non-technical description of packet radio, followed by chapters including *Getting Started, Setting Up Your Station, Operating Packet to Networking* and *HF Operation.* There is even a *Packet Radio Equipment Survey* and an appendix that includes circuits for interfacing equipment! Get ***How To Get Started in Packet Radio* today for only $9.95 ($2.00 S&H).** #B670



ATV Secrets For Aspiring ATV'ers

ATV Secrets For Aspiring ATV'ers, written by Henry Ruh, KB9FO, contains everything you wanted to know about Amateur Television (ATV). All ham licensees can participate in ATV—*even those with the new no-code license!* Amateur TV is fun and exciting. Take your home video productions and find new audiences, make new friends and get more enjoyment from your equipment. Hams should be *seen* as well as heard!

ATV Secrets is available through all major Amateur Radio equipment stores, or you can order from NARA for only **$9.98 ($2.00 S&H)** #B630.

The FCC Question Pools—

Each booklet contains all the questions and answers for each license class. Does not contain explanations. Order your booklet by license class.

- Novice and Technician classes together (all the questions for the new code-free Technician class license) **$4.95 (S&H $1.50)** #B650.
- General Class **$3.00 (S&H $1.00)** #B651
- Advanced Class **$3.00 (S&H $1.00)** #B652
- Extra Class **$3.00 ($1.00 S&H)** #B653.

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- News of interest to Novice and Technician operators
- Help upgrading your license class
- News and developments of particular interest to Novice and Technician class hams
- Pictures and news about other Novice and Technicians
- Hot Tips - news you need as an Amateur

NARA publishes the only ham magazine that addresses these subjects in a simple-to-understand manner.

What's NARA Doing?

The goals of NARA are to:

- Publicize Amateur Radio to the general public
- Get more young people involved in our hobby
- Prevent confiscation of Amateur spectrum and obtain additional allocations for Novices and Technicians
- Represent the interests of Novice and Technician class operators

Amateur Radio recently lost part of the 220-MHz band and, in some areas of the country, is in the process of *losing access* to another band (900 MHz).

NARA is striving to get more people involved in the Amateur Service so we can increase activity and retain our remaining Amateur bands.

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